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Do children adopted from British foster care show difficulties in executive functioning  
and social communication?

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## ABSTRACT

Early life experiences leave a mark on a child's emotional, social and cognitive development. It is well established that children adopted from psychosocially depriving institutions have difficulties in executive functioning and social communication ability, however this type of research has not been replicated in children adopted from foster care. In this study 30 primary school aged UK adoptees without a history of institutionalisation completed an assessment of their intellectual, executive functioning and social communication abilities. Compared to children of a similar age in the general population, the adopted group showed elevated emotional and behavioural difficulties on a parental report measure (Strengths and Difficulties Questionnaire, SDQ). They performed statistically poorer on two of three computerised executive functioning tests (CANTAB Intra-Extra Dimensional Shift and Spatial Working Memory) and elevated scores were observed on a parental report measure of executive functioning (Behavior Rating Inventory of Executive Functioning, BRIEF). A strong negative correlation was found between age of adoption and BRIEF scores controlling for ADHD symptoms, no other pre or post adoption variables strongly correlated with executive functioning. Although all participants scored below cut-off on an autism screening measure (Social Communication Questionnaire, SCQ), a moderate positive correlation was observed with age of adoption. The identified elevation in emotional, behavioural and executive

functioning difficulties is in line with previous research examining children adopted from institutions, however the observed negative correlation between BRIEF scores and age of adoption is contrary to previous research. Limitations and implications for future research are discussed.

**Keywords**

Adoption, executive functioning, social communication, BRIEF, CANTAB, SCQ, SDQ, child development, maltreatment, abuse, foster care

## **Introduction**

In England 69,540 children were placed in care at the end of March 2015, most of whom (61%) became known to social services due to experiences of abuse or neglect (ONS, 2015). It has been proposed that the needs of many children who are looked after (with plans to remain in care) would be best met through adoption (DfE, 2012). In line with this there has been a government supported drive to increase adoption rates and reduced the average age of adoption (DfE, 2012).

The recent surge in studies and reviews examining the impact of childhood maltreatment and early life stress on cognitive functioning has suggested a noticeable impact on a wide range of functions including: IQ, memory, working memory, executive functioning and attention (Carrey et al., 1995; Hart and Rubia, 2012; Nolin and Ethier, 2007; Pechtel and Pizzagalli, 2011). Neurobiological studies have further evidenced that extreme stress during developmentally sensitive periods can lead to profound neurobiological changes which can endure following maltreatment ceasing (Anda et al., 2006; Chugani et al., 2001; Hanson et al., 2013; Hart and Rubia, 2012).

Executive functioning has become of increasing interest within the field of child maltreatment due to its pertinent role in several aspects of a child's social and

academic development (Blain-Briere et al., 2014; Bull et al., 2008; Cartwright, 2012; Gathercole et al., 2004). Executive functioning is an umbrella term which encompasses a wide range of cognitive processes that govern purposeful goal-directed behaviour and how we respond to novel situations (Hughes, 2011). To date the majority of research on executive functioning in adopted children has focused on children adopted from non-UK psychosocially depriving institutions. In this population of post-institutionalised children executive functioning difficulties have been identified via parental report (Groza et al., 2008; Merz and McCall, 2011; Merz et al., 2013) as well as on experimental tasks (Bauer et al., 2009; Bos et al., 2009; Cardona et al., 2012; Colvert et al., 2008; Eigsti et al., 2011; Hanson et al., 2013; Loman et al., 2013; McDermott et al., 2012; Merz et al., 2013; Pollak et al., 2010). Executive functioning performance has been hypothesised to be associated with duration of institutionalisation, with later adoption being linked to poorer abilities.

Interestingly social communication deficits and ‘quasi-autistic’ traits have also been observed in post-institutionalised studies (Rutter et al., 1999). The term quasi-autistic traits was coined to highlight the difference from typical autism as these children displayed *“a significantly greater degree of improvement between ages 4 and 6 years... unusual spontaneity and flexibility of communication... and an*

*unusual degree of social approach*" (Rutter et al., 2007c, p1205). Colvert et al (2008) noted that the children displaying quasi-autistic traits performed statistically significantly poorer on measures of executive functioning and theory of mind, suggesting that these abilities may play a mediating role in quasi-autistic traits arising from maltreatment.

Rutter and colleagues (2009) highlighted the need for caution when trying to generalise the findings from post-institutionalised studies to children adopted from other circumstances. Theoretically children adopted from foster care should have experienced less psychosocial deprivation, but possibly more active maltreatment than those adopted from institutions, this may result in a different neuropsychological profile of strengths and weaknesses. To date there has been a paucity of research specifically assessing executive functioning and social communication in domestically adopted children and often comparison studies have recruited children adopted at very young ages (e.g. <6 months) making comparisons more difficult. Of studies assessing executive functioning ability in domestically adopted children inhibitory control deficiencies have been suggested (Mueller et al., 2012) and when controlling for age and working memory, inhibitory control performance has been found to relate to a history of placement instability (Lewis et al., 2007). Domestically adopted children before the age of six

months were identified to display significantly better performance on executive functioning tasks compared to children adopted from psycho-socially depriving institutions and no quasi-autistic traits (Beckett et al., 2010; Colvert et al., 2008). However, considering the hypothesised impact of age of adoption on outcomes this may represent an age of adoption effect rather than a genuine lack of difficulties existing.

The current study will address some of the aforementioned gaps in the domestically adopted literature. Specifically this study will explore whether UK adoptees without prior experience of institutionalization show executive functioning deficits compared to norms, akin to those observed in post-institutionalised children. Furthermore this study will examine whether executive functioning performance correlates with social communication traits. The relationship between pre-adoption maltreatment variables and executive functioning and social communication abilities will be explored. Finally, this study will investigate whether an association exists between time since adoption and executive functioning and social communication scores.



## **Methods**

### *Participants*

A power analysis focusing on the primary hypothesis of detecting differences compared with norms identified that 27 participants would be needed to discover a medium effect size ( $d = 0.5$ ) with the probability of making a type one error being 0.05 and power being 0.80. An opt-in design was employed; this study was advertised in the Adoption UK magazine and circulated by voluntary adoption agencies. 48 potential participants requested information; of these three were excluded due to being outside of the study age range. 31 of the 45 potential participants (69%) completed the research assessment, reasons for not taking part in the study included: difficulties with attending the assessment, the child declining to take part and being unable to contact parents following initial interest. One participant was excluded from the analysis following identifying their IQ to be in the impaired range ( $<70$ ) on the second version of the Wechsler Abbreviated Scale of Intelligence (WASI-II).

### *Inclusion and Exclusion Criteria*

Children aged 7-11 years who were adopted from foster care within Britain were included in the study. Both the child and adoptive parents had to be proficient in English to a level where they could complete the assessment without an interpreter.

Children with a formal diagnosis of Autistic Spectrum Disorder (ASD) or a global learning disability were excluded from participation.

### *Demographic information*

Of the 30 children included in the analysis, 60% (n=18) were male and the mean age was 9.06 years (range 7 to 11.92 years). The majority of participants were classified ethnically as White British (80%, n = 24), 6.7% (n = 2) as Black British, 6.7% (n = 2) as White Asian, 3.3% (n = 1) as Mixed African/European and 3.3% (n = 1) as Mixed Indian/White British. The mean age of adoption was 3.9 years (SD = 2 years) and the mean length of time since the adoption order was granted was 5.4 years (range 1 to 9.4 years). Of the 27 parents who had information relating to prior experience of maltreatment, 24 adoptees (88.9%) were reported to have experienced at least one form of maltreatment.

### *Assessment measures*

*The Development and Well-Being Assessment (DAWBA).* The DAWBA (Goodman et al., 2000) was completed to screen for psychiatric symptoms and associated functional impairment. Due to the potential for ADHD difficulties to produce false positives on measures of executive functioning (Hughes and Graham, 2002), the DAWBA was

additionally employed to measure and extract ADHD symptoms, enabling this to be controlled for in the analysis.

The DAWBA has been used extensively clinically and in research (e.g. Ford et al., 2007; Meltzer et al., 2000; Meltzer et al., 2003). It has demonstrated strong validity in differentiating clinical and non-clinical samples (Fleitlich-Bilyk and Goodman, 2004; Goodman et al., 2000) and accuracy in predicting mental health conditions (e.g. Fleitlich-Bilyk and Goodman, 2004; Foreman et al., 2009; Goodman et al., 2000).

The widely used Strength and Difficulties Questionnaire (SDQ; Goodman, 1997) is embedded within the DAWBA assessment. The SDQ calculates five subscales that outline; emotional problems, conduct problems, hyperactivity, peer problems and prosocial behaviours, as well as a score of total difficulties. The SDQ data and the likelihood of specific diagnoses were extracted from the DAWBA to quantify emotional and behavioural difficulties (see Goodman, 2001 for a description of psychometric properties of the SDQ).

*The second version of the Wechsler Abbreviated Scale of Intelligence (WASI-II).* The WASI-II (Wechsler, 2011) was administered to gather an overview of overall cognitive abilities. The WASI-II consists of 4 sub-tests, which measure crystallised abilities, non-verbal fluid abilities and visuomotor/coordination skills. The WASI-II has been

standardised on a large sample of children and has demonstrated concurrent validity with longer assessments of IQ (Wechsler, 2011). In addition the WASI-II is reported to demonstrate acceptable to excellent test-retest stability with children (.79-.90) and excellent inter-rater reliability (.94-.99) (Wechsler, 2011).

*The Behavior Rating Inventory of Executive Functioning (BRIEF).* The BRIEF (Gioia et al, 2000) was completed by adoptive parents to measure executive functioning. The BRIEF was developed as a more ecologically valid measure of executive functioning compared to traditional neuropsychological assessment tools that are administered in highly structured and distraction free environments (Gioia and Isquith, 2004). The BRIEF produces three scales: the Global Executive composite, Behavioural Regulation and Metacognition. High internal consistency has been demonstrated (Cronbach  $\alpha$  scores between .80-.98) and confirmatory factor analyses have supported the validity of the BRIEF as a measure of executive functioning consistent with theoretical models of executive functioning (Gioia, et al, 2000; Gioia et al., 2002; Gioia et al., 2010).

*Cambridge Neuropsychological Test Automated Battery (CANTAB).* Four sub-tests were completed from the CANTAB (Cambridge Cognition); Paired Associate Learning (PAL) (a task which assesses visual memory and new learning), Spatial Working Memory (SWM) (a task which requires the retention and manipulation of visuospatial information), Stocking of Cambridge (SOC) (a spatial planning task), and Intra-Extra

Dimensional Shift (IED) (a test of rule acquisition and reversal). All selected sub-tests had been used in prior post-institutionalised research (Bauer et al, 2009; Bos et al, 2009; Hanson et al., 2013; Merz et al., 2013; Pollak et al, 2010). The CANTAB has been well validated for use with children of this age range and high internal consistency coefficients were reported (.73-.95) (Luciana and Nelson, 2002). A range of studies have demonstrated the construct and discriminant validity for children (see Henry and Bettenay, 2010).

*Social Communication Questionnaire – current version (SCQ).* The SCQ (Rutter et al., 2003) was used to measure social communication traits. The SCQ has shown good discriminative validity between ASD and other non-Autistic disorders in children over the age of 4 years (Berument et al., 1999; Chandler et al., 2007). Correlations with longer ASD assessment tools such as the Autism Diagnostic Interview- Revised (ADI-R; Rutter et al., 2005) have been found between .50 and .71 (Berument et al, 1999; Hanson et al., 2002).

*Demographic questionnaire.* Demographic data was collected using questions extracted from a questionnaire developed in partnership with Adoption UK service users. This questionnaire gathered information on variables which might influence performance on the cognitive, emotional and social assessment measures including: age the child left the birth family, age of adoption, time since adoption, and reported history of maltreatment.

### *Procedure*

Following gaining ethical consent from both the parent and child the face-to-face assessment was conducted with the child. To reduce possible fatigue effects the CANTAB and WASI-II were counter-balanced in their order of administration. All parent report measures were completed by one parent.

### *Data analysis plan*

Correlations between CANTAB executive functioning sub-tests and the BRIEF ranged from  $r=.01$  to  $r=.44$ , and varied in direction, consequently these measures were not aggregated and analyses were performed separately on the BRIEF and CANTAB.

To complete the primary objective of the study and assess whether children adopted from UK foster care showed executive functioning deficits compared to normative data, one-sample t-tests were run between executive functioning measures and normative

data for the BRIEF and the CANTAB sub-tests. Bivariate correlations were run to identify relationships between: the SCQ and executive functioning scores, and to explore the impact of pre-adoption maltreatment related variables (age that a child left the birth family and age of adoption) and time since adoption on outcome measures. Partial correlations were used to control for variables that could potentially influence outcome measures (ADHD symptoms, IQ and gender). Independent samples t-tests were used to identify statistically significant within group differences related to history of maltreatment.

## Results

### *Mental health*

Elevated difficulties on all SDQ scales were observed compared to the national norms<sup>1</sup> with the difference reaching statistical significance for all but one scale, peer problems (see figure 1). Independent samples t-tests revealed no statistically significant effects of gender on any of the SDQ scales.

**Table 1.** SDQ data for the adopted sample compared to normative data extracted from Meltzer et al., (2000).

	Adopted sample (n=30)		National norms (n=10298)		ES (r)
SDQ scale	Mean	SD	Mean	SD	
Emotional symptoms	3.2	2.7	1.9	2.0	.31*
Conduct problems	3.3	2.3	1.6	1.7	.45**
Hyperactivity	6.6	3.4	3.5	2.6	.51**
Peer problems	1.9	2.2	1.5	1.7	.12
Prosocial scale	7.5	2.5	8.6	1.6	.32*
Total difficulties	15.1	7.9	8.4	5.8	.50**

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<sup>1</sup> As the age range of participants in this study fell across more than one age band on the SDQ norms the total national norms were used for comparisons.



Impact score	3.3	2.8	0.4	1.1	.80**
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\*  $p < .05$

\*\*  $p < .001$

### *Cognitive functioning and visual memory*

Adopted participants scored within the average range for all WASI-II scales: Full Scale IQ (FSIQ) (mean=96.93, SD=13.7), Verbal Comprehension Index (VCI) (mean=100.67, SD=15.30) and Perceptual Reasoning Index (PRI) (mean=94.07, SD=13.72). A one-sample t-test identified the mean PRI score to be statistically significantly below the norm of 100 ( $t(29)=-2.37$ ,  $p=.025$ ) but within the normal range. No other significant differences were identified and small effect sizes were observed ( $r=.10$ ,  $r=.02$ ,  $r=0.19$  respectively).

In comparison to the CANTAB normative data, no difficulties with visual memory were identified on the Paired Associate Learning (PAL) test ( $t(26)=.35$ ,  $p=.73$ ), consequently this was excluded from later analyses.

### *Executive functioning*

All executive functioning BRIEF index scores were found to be significantly above normative values <sup>2</sup> : Behavioral Regulation Index (BRI) ( $t(29)=6.2$ ,  $p=.000$ ), Metacognition Index (MI) ( $t(29)=5.8$ ,  $p=.000$ ), and Global Executive Composite (GEC) ( $t(29)=6.4$ ,  $p=.000$ ). Medium to large effect sizes were observed ( $r=.47$  -  $r=.51$ ).

Statistically significant differences were observed for two of the CANTAB executive functioning sub-tests<sup>3</sup>: Intra-Extra Dimensional Shift (IED) total errors adjusted ( $t(29)=-2.93$ ,  $p=.007$ ) and Spatial Working Memory (SWM) between errors ( $t(29)=-4.26$ ,  $p=.000$ ). A difference was not observed for the Stocking of Cambridge (SOC) task ( $t(25)=-1.59$ ,  $p=.13$ ). Small to medium effect sizes were observed ( $r=.14$  -  $r=.37$ ).

**Table 2.** Executive functioning scores for the adopted sample compared to normative data, with significance testing and effect sizes

	Mean	SD	Description	Difference	ES (r)
<b>BRIEF<sup>a</sup></b>					

<sup>2</sup> The total normative data for children age 5-18years was used in comparisons, this was gained from Gioia et al (2000),  $n=1,419$

<sup>3</sup> Test performance was compared to the CANTAB internal normative data and matched to age. This normative data is drawn from the results of 3000 healthy participants aged 4 to 90 years.

Behavioral Regulation Index (BRI)	65.63	13.85	Elevated	p<.001	.50**
Metacognition Index (MI)	63.37	12.64	Average	p<.001	.47**
Global Executive Composite (GEC)	65.33	13.11	Elevated	p<.001	.51**
<b>CANTAB<sup>b</sup> executive functioning tasks</b>					
Intra-Extra Dimensional Shift (IED) (total errors adjusted)	-0.45	0.84	Average	p=.007	.22*
Stocking of Cambridge (SOC) (problems solved in minimum moves)	-0.29	0.94	Average	p=.125	.14
Spatial Working Memory (SWM) (between errors)	-0.79	1.02	Low average	p<.001	.37**

<sup>a</sup> The BRIEF T-scores are presented here, mean T score = 50, SD = 10.

<sup>b</sup> CANTAB scores are presented as z-scores, mean = 0, SD = 1.

\*  $p < .05$

\*\*  $p < .001$

#### *Predictors of BRIEF ratings*

The DAWBA measure of ADHD symptoms significantly correlated with all BRIEF indices ( $r=.48$ -  $r=.95$ ), consequently this was controlled for when exploring predictors of BRIEF ratings. Independent samples t-tests identified no statistically significant impact of gender ( $t(28)=.85$ ,  $p=.403$ ) on the BRIEF GEC, nor with IQ ( $r=.19$ ), therefore these variable were not controlled for.

Controlling for ADHD symptoms a statistically significant negative correlation was observed between the BRIEF GEC and age adopted, with children adopted earlier having lower EF scores ( $r_p = -.42$ ,  $p = .025$ ). Non-significant correlations were found between the BRIEF GEC and age left birth family home ( $r_p = -.27$ ,  $p = .160$ ), time since adoption ( $r_p = .23$ ,  $p = .227$ ) and age at assessment ( $r_p = -.08$ ,  $p = .683$ ).

#### *Predictors of CANTAB executive functioning performance*

CANTAB executive functioning tasks demonstrated weak correlations with the DAWBA measure of ADHD symptoms ( $r = .01 - r = .17$ ) and FSIQ ( $r = -.04 - r = .29$ ). No statistically significant impact of gender on the CANTAB executive functioning tasks was identified: IED ( $t(28) = 1.15$ ,  $p = .260$ ), SOC ( $t(28) = -.63$ ,  $p = .534$ ), SWM ( $t(28) = .28$ ,  $p = .783$ ). Consequently none of these variables were controlled for when assessing predictors of CANTAB performance.

A medium correlation between CANTAB IED performance and age was found, this reached statistical significance ( $r = -.40$ ,  $p = .028$ ). No other statistically significant correlations were observed between any of the CANTAB executive functioning tasks and demographic variables.

**Table 3.** Pearson's  $r$  correlations between CANTAB executive functioning tasks and demographic variables

	Age	Age left birth family	Age adopted	Time since adoption
IED	-.40*	-.19	-.11	-.22
SOC	-.14	.20	.13	-.25
SWM	-.10	.19	-.18	-.23

\* $p < .05$

#### *Social Communication traits*

No participant scored above the recommended cut-off on the SCQ for further ASD screening ( $>15$ ; Rutter et al., 2003) (mean 4.7,  $SD=3.7$ , range 0-12). Controlling for ADHD, SCQ scores were found to correlate strongly with the BRIEF GEC ( $r_p = -.64$ ,  $p = .000$ ), with lower SCQ scores being associated with better executive functioning scores. This effect was not replicated for any of the CANTAB executive functioning sub-tests ( $r = -.01$  –  $r = .17$ ). Statistically significant between gender differences on the SCQ scores were identified ( $t(28) = 1.68$ ,  $p = .041$ ) with males being rated higher (mean = 6.61,  $SD = 4.04$ ) than females (mean = 3.33,  $SD = 2.84$ ) and was consequently controlled for. FSIQ was not found to correlate with SCQ scores ( $r = -.07$ ,  $p = .714$ ) and therefore was not controlled for.

### *Predictors of SCQ scores*

No significant correlations were found between SCQ scores and: age ( $r=.04$ ,  $p=.85$ ), time since adoption ( $r=-.19$ ,  $p=.32$ ) and age left birth home ( $r=.22$ ,  $p=.24$ ). A significant correlation was observed between age adopted and SCQ score, this effect remained when gender was controlled for ( $r_p=.41$ ,  $p=.028$ ).

### *Impact of known maltreatment*

While children without a known history of maltreatment performed better on the CANTAB SWM and IED sub-tests, BRIEF GEC, WASI-II, SDQ and SCQ (figure 4), none of these differences were found to be statistically significant through independent samples t-tests ( $p>.05$ ). Medium effect sizes were observed for the SCQ and SDQ total scores.

**Table 4** - Displays the profile of scores divided into children with and without histories of maltreatment.

Measure	History of maltreatment (n=24) Mean (SD)	No history of maltreatment (n=3) Mean (SD)	Difference	ES (r)
CANTAB SOC	-.27 (1.03) <sup>a</sup>	-.42 (.40)	-0.15	.07
CANTAB SWM	-.72 (.99)	-.51 (.38)	.21	.11

CANTAB IED	-.42 (.76)	-.04 (1.61)	.38	.22
SCQ total score	5.29 (3.91)	2.00 (1.73)	-3.29	.40
BRIEF GEC	65.54 (13.16)	57.33 (15.63)	-8.21	.29
WASI-II FSIQ	95.54 (11.69)	100.00 (2.65)	4.46	.20
SDQ total score	15.08 (7.51)	8.00 (6.56)	-7.08	.43

<sup>a</sup> n = 21

## **Discussion**

This study identified that domestically adopted children without a history of institutionalization displayed some executive functioning difficulties compared to normative data in the context of preserved overall cognitive ability, visual learning and memory. Compared to normative data statistically significant reductions in executive functioning were found on the two of the three CANTAB tasks (SWM and IED) and significantly more difficulties were observed via parental report on the BRIEF. Age adopted correlated strongly with the BRIEF GEC, controlling for ADHD symptoms, with older age being associated with fewer reported difficulties. Additionally age at assessment was strongly correlated with CANTAB IED performance. No further pre or post adoption variables significantly correlated with executive functioning performance.

There was little evidence of autistic traits as all participants scored below the recommended cut-off on the SCQ (children with a formal diagnosis of ASD were excluded from the study). As expected, males were rated as displaying significantly more social communication traits. Controlling for gender, a moderate correlation was observed between SCQ scores and age adopted, with children older at adoption scoring higher on the SCQ, albeit at a sub clinical threshold.



Participants were reported to display more difficulties on the SDQ than the normative sample for: emotional problems, conduct problems, hyperactivity, pro-social behaviours, total difficulties and level of impact. This is in line with the extensive research looking at the mental health of looked after children that has identified elevated rates of emotional and behavioural difficulties (e.g. Ford, Vostanis, Meltzer, & Goodman, 2007; Garland, Hough, McCabe, Yeh, Wood & Aarons, 2001). Of interest a high overall impact of the difficulties was reported despite only slightly elevated specific disorder scores.

Of note all parent report measures (SDQ, SCW and BRIEF) were found to strongly correlate. Similarly, McAuley, Chen, Goos, Schachar, & Crosbie, (2010) found weak correlations between the BRIEF and direct executive functioning tasks, but strong correlations with parental reports of ADHD symptoms and behavioural difficulties. While this could indicate that these areas of functioning correlate strongly, it is likely to be identifying biases in reporting (i.e., same method, same informant).

It was not possible to reliably test the effects of a history of maltreatment however, children reported to have not experienced pre-adoption maltreatment displayed better scores on parental report measures (SDQ, SCQ and BRIEF) as well as on the WASI-II and CANTAB SWM and IED. These differences did not reach statistical significance but medium effect sizes were observed for the SCQ and SDQ total scores. This analysis

was limited by the small number of participants reported to either not have experienced maltreatment (n=3) or whose history was unknown (n=3).

### *Results in context of literature*

The findings of specific executive functioning difficulties is in line with the two studies reporting inhibitory control difficulties in domestically adopted children (Lewis et al., 2007; Mueller et al., 2012) as well as the current literature assessing CANTAB and BRIEF performance in post-institutionalised children (e.g. Bauer et al., 2009; Bos et al., 2009; Groza et al., 2008; Hanson et al., 2013; Merz and McCall, 2011; Merz et al., 2013a; Pollak et al., 2010). The lack of strong correlations between the executive functioning measures alongside the deficits observed across them, is in line with models of executive functioning which suggest it to be a broad construct. Furthermore, the lack of identified cognitive and memory difficulties support that executive dysfunctioning in children adopted from foster care is distinct from general cognitive abilities.

A strong negative association was identified between age of adoption and BRIEF scores (controlling for ADHD symptoms). This is largely inconsistent with the literature on post-institutionalised children, where younger age of adoption has been associated with improved executive functioning performance on parental report measures (Jacobs et al., 2010; Groza et al., 2008; Merz and McCall 2011; Merz et al., 2013a; Merz et al.,

2013b), and laboratory assessment tools (Colvert et al., 2011; Eigsti et al., 2011; Loman et al., 2013; Merz et al., 2013c; Tottenham et al., 2010). Although this effect appears counterintuitive, it might reflect that children are removed from birth families at an earlier age (and as a result placed for adoption sooner) due to maternal drug or alcohol abuse in utero or more severe and identifiable forms of early maltreatment. This study did not have the data necessary to explore this hypothesis however, no notable correlations were observed between age removed from birth family home and executive functioning.

For children adopted from foster care a rough measure of duration of hypothetical maltreatment appears an inadequate predictor of cognitive and social development. This highlights the difficulty in attempting to generalise research on post-institutionalised adoptees to children from non-institutionalised settings. Other pre-adoption variables, such as the quality of care received or ‘dose’ or severity of maltreatment, may be more important developmentally for non-institutionalised children. Childhood maltreatment in the context of both remaining with and being removed from birth families has been associated with difficulties in executive functioning (Bierman et al., 2008; Cicchetti, 2002; De Bellis, 2005; Hughes, 2011; Pears et al., 2010). Additionally positive correlations between ratings of quality of institutional environment and executive functioning scores, and time spent with birth family before adoption and executive functioning scores have been identified (Hostinar

et al., 2012). Quality of pre-adoption care is difficult to measure retrospectively and as a result this was not explicitly measured, nonetheless a potential impact of maltreatment history on SDQ and SCQ scores was noted in this study.

In contrast the observed large correlation between age of adoption and SCQ scores is in line with outcomes from the ERA studies that identified a step-wise increase in ‘quasi-autism’ in Romanian orphans adopted after the age of 6 months (Colvert et al., 2008; Kreppner et al., 2007). For a portion of these post-institutionalised children these traits showed gradual diminishment from age 4 to 11 years (Rutter et al., 2009). In this study no correlation was observed between time since adoption from foster care and SCQ scores, but as this sample of children were not scoring above the cut-off threshold for ASD screening less possible ‘recovery’ could have been observed.

#### *Potential limitations*

Executive functioning deficits have consistently been observed in children with ADHD (Glass et al., 2013; Willcutt et al., 2005) thus difficulties observed on the CANTAB and BRIEF may reflect attention and hyperactivity problems as opposed to a distinct executive functioning impairment. In this study measures of ADHD correlated strongly with BRIEF scores, suggesting that they might assess related or shared difficulties. However, significant correlations were not observed with performance on the CANTAB

executive functioning sub-tests. Previous studies have continually shown SWM, SOC and IED task performance to be impacted by ADHD (Chamberlain et al., 2011; Fried et al., 2015; Glass et al., 2013). The absence of significant correlations between ADHD symptoms and CANTAB scores supports the robustness of the findings of executive functioning difficulties.

Measures used to assess executive functioning have been criticised for lacking sensitivity and ecological validity, especially with adult populations. It is well reported that adults with frontal lobe damage can show intact performance on executive functioning tasks but display debilitating effects on daily life (e.g. Eslinger & Damasio, 1985; Levine, Robertson, Clare, Carter, Hong, Wilson et al., 2000). The CANTAB was selected since it is a well validated for this age range (Luciana & Nelson, 2002) and it has been used in a number of studies examining executive functioning in children adopted from institutions. A strength of this study is that it used a potentially more ecologically valid tool (the BRIEF) alongside the experimental tasks to gain a broader picture of functioning.

This study employed an opt-in recruitment strategy as it was the most viable way to gain access to this non-clinical population. This may have led to a recruitment bias which could in turn limit the generalisability of findings. However, participants were broadly similar to the national adoption averages in terms of gender, ethnicity and age

of adoption (DfE, 2016). In addition aspects of the analysis may have been impacted by the limited number of participants. For example note-worthy but non-significant effect sizes were observed for the impact of reported history of maltreatment on parent ratings of social communication traits and emotional and behaviour difficulties. This might reflect an underlying issue with the statistical power for the findings outside of the main hypotheses.

This study identified executive functioning difficulties in UK adopted children without experiences of institutionalised care. Factors impacting on the degree of difficulties appear to be different for adopted versus post-institutionalised children highlighting the need for caution when generalising findings from the post-institutionalised research. Future comparison studies are needed to disentangle the influence of pre-placement experiences and in particular the impact of dose of maltreatment and quality of pre-adoptive care. Prospective longitudinal studies identifying and assessing children from point of adoption could enable us to develop a more accurate picture of potential risk factors for executive functioning, emotional, behavioural or social communication difficulties, by assessing quality and dose of maltreatment more precisely.

To sum up, this study sought to compare a sample of 30 primary aged children adopted from foster care with children of a similar age in the general population to see if the adopted children faced specific problems. It looked at three aspects of their lives: the

mental processes that enable us to plan and complete new tasks (executive functioning), the skills needed to communicate and interact with others (social communication) and whether the children experience emotional or behavioural difficulties. Where possible we made comparisons between the two groups, taking into consideration aspects of the adopted children's lives such as their age at adoption and previous experiences of maltreatment. Adopted children showed slightly more problems with executive functioning and emotional and behavioural difficulties, but no exceptional difficulties in overall intellectual functioning or social communication skills. Children who were adopted at an older age were rated by parents as having fewer executive functioning difficulties, although this correlation was not observed when children completed practical executive functioning tasks. It is hoped that this article will help practitioners to be aware of the potential for executive functioning difficulties, to recognise when these problems do occur, to understand that they can look different in different contexts and to offer the interventions that best help these children.

## 5. References

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